

REMARKS

The Examiner rejected claims 1-2 and 10-13 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,667,882 to Fourezon et al. The Examiner stated that "Fourezon discloses a first layer of carded fibers such as polypropylene fibers which have a layer of continuous glass fibers disposed thereon, wherein the two layers are then needled to form a mixed fiber mat." Applicant has amended independent claims 1 and 11. All of the claims are now allowable.

In the Applicant's invention, the glass fiber mat is formed using the method described in the Modigliani patents (U.S. Patents No. 2,546,230; 2,609,320 and 2,964,439), which were incorporated by reference in the application. The Modigliani method makes a mat from continuous glass filaments. The filaments of each layer lie in approximate parallelism and the filaments of adjacent layers cross each other at relatively acute angles. (See U.S. Patent No. 2,609,320 at column 2, lines 40-44.) This method results in a mat in which the glass fibers are non-random and have an orientation that is deliberately engineered to give the resulting part greater strength in some directions over others. In one example, the fibers are at oriented at about 90° to longitudinal and parallel to longitudinal, which imparts greater bending strength in the finished product in one direction and at 90 degrees from that direction. There can, of course, be variations on the strengthened orientation. What is clear, though, is that the fibers of the invention are not randomly oriented.

After the non-random glass fiber mat is formed, a layer of polypropylene fibers is applied to the mat. In the present invention the polypropylene fibers can have a random

orientation, because the polypropylene fibers will eventually be melted to flow around the reinforcing glass fibers to form the matrix of the composite. Thus, the polypropylene fibers form the matrix in the ultimate composite; the glass fibers reinforce the matrix.

In contrast, the web of the Fourezon Patent is formed from polypropylene fibers and then the glass fibers are sprayed on to the polypropylene and spread out flat, randomly in all directions (see column 1, lines 50-56). The random glass fibers in Fourezon have equal strength in all directions. This is different from the strength characteristics that results from Applicant's non-random glass fiber mat. Thus, Fourezon does not anticipate the invention, and the amended claims are allowable under §102.

The Examiner also rejected claims 1-18 under 35 U.S.C. §103(a) as being unpatentable over Fourezon et al. in view of U.S. Patent No. 5,441,590 to Ihm. In light of the amendments to the claims, these claims are allowable.

The Examiner stated that Ihm "teaches additional layers including fiberglass and polymeric fiber layers may be added to needled multi-layer laminates which comprise fiberglass and polymer fibers in order to enhance the strength, thermal resistance and fluidity of the laminates". The Examiner further stated that "it would have been obvious to have added additional layers to the material of Fourezon as taught by Ihm, to enhance the overall strength".

As described above, Applicant's mixed fiber mat has non-random glass fibers intertwined with thermoplastic fibers, such as polypropylene. Ihm teaches a polypropylene film combined with glass fibers, but not polypropylene fibers. A film is different from fibers, and is disadvantageous in this area of technology. The advantage of Applicant's

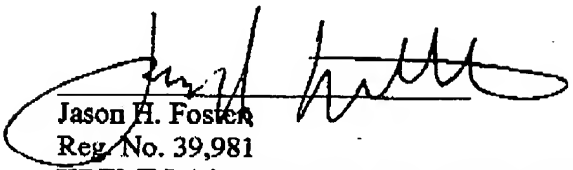
thermoplastic fibers over Ihm's film is the intertwining of Applicant's fibers with the glass fibers in the mat during needle-punching. By intertwining the fibers, the dispersion of the thermoplastic through the glass fibers upon heating is enhanced. This results in a superior composite to that with the Ihm reference. Ihm only needle-punches the glass fiber mat alone (see column 3, lines 25-29) and does not attempt to intertwine the thermoplastic film with the glass fibers, or vice versa.

The claimed invention would not have been obvious from Fourezon and Ihm, because there is no suggestion in the prior art to make the combination, and there are two teachings away from limitations in the invention. First, Fourezon teaches away from non-random glass fibers. Fourczon teaches to use randomly oriented glass fibers that provide the same reinforcement in every direction. Applicant goes against this. Second, Ihm teaches to use a thermoplastic film rather than thermoplastic fibers, as Applicant claims. The advantage of thermoplastic fibers is a result of the enhanced flow of the polymer forming the composite's matrix due to intertwining of the two kinds of fibers. Thus, it would not have been obvious to arrive at Applicant's claimed invention, and the amended claims are allowable under § 103.

Therefore, reconsideration and allowance are respectfully requested. The Commissioner is authorized to charge Deposit Account No. 13-3393 for any insufficient fees under 37 CFR §§ 1.16 or 1.17, or credit any overpayment of fees.

Respectfully submitted,

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Date of Signature


Jason H. Foster

Reg. No. 39,981

KREMBLAS, FOSTER, PHILLIPS & POLLOCK

7632 Slate Ridge Blvd.

Reynoldsburg, OH 43068

Voice: 614/575-2100

Fax: 614/575-2149

email: jfoster@ohiopatent.com